

Properties of Matter

5-4 The student will demonstrate an understanding of properties of matter. (Physical Science)

5-4.4 Use the processes of filtration, sifting, magnetic attraction, evaporation, chromatography, and floatation to separate mixtures.

Taxonomy level: 3.2-B Apply Procedural Knowledge

Previous/Future knowledge: In 2nd grade (2-4.4), students recognized that different materials can be mixed together and then separated again. They have been introduced to the concept of magnetic attraction in 2nd grade (2-5.1) and in 4th grade (4-5.9) and to the process of evaporation in 3rd grade (3-4.2). Students will further develop the concept of physical changes in 7th grade (7-5.10)

It is essential for students to know and use the processes of filtration, sifting, magnetic attraction, evaporation, chromatography, and floatation to separate mixtures. –

Filtration

- *Filtration* is used to separate solid particles from a liquid.
- For example, pouring the mixture through a filter paper in a funnel will trap the solid particles and only allow the particles of the liquid to pass through.
- This method is used in water treatment plants as part of the process for separating dirt and other solid particles from water to produce clean drinking water.

Sifting

- *Sifting* is used to separate smaller solid particles from larger solid particles.
- For example, the mixture of different sized solid particles can be put into a container that has a screen material at the bottom with holes of a certain size.
- When the mixture is shaken, the smaller particles go through the screen leaving the larger particles in the container.
- Cooks, for example, sift flour to get a small particle size for baking leaving larger particles of flour in the sifter above the screen.
- Sand and gravel companies, for example, separate rocks into different sized particles for road building and other construction projects using this method.

Magnetic attraction

- *Magnetic attraction* is used to separating magnetic material from a mixture of other substances.
- When a magnet is stirred through the mixture, it pulls out the magnetic material from the mixture.
- A cow magnet, for example, is given to a cow to swallow. It stays in the first stomach of the cow keeping magnetic materials like wire and other harmful materials that cows swallow from going into the rest of their digestive system.

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Evaporation

- *Evaporation* is used to separate a solid that has dissolved in a liquid solution.
- The solution is heated or left uncovered until all the liquid turns to a gas (evaporates) leaving the solid behind.
- Salt in salt water or ocean water, for example, is separated by heating the solution until all the water evaporates leaving the solid salt in the container.

Chromatography

- *Chromatography* is used to separate and analyze the solutes in a solution.
- For example, a small amount (2-3 drops) of the solution is put on a piece of filter paper, which is put in a solvent.
- The substances in the solution that dissolve most easily travel the furthest; and substances that do not dissolve easily do not travel very far.
- The bands of color that are formed allow scientists to identify the substances in the solution by comparing them to the location of known substances forming bands of color on different filter papers.

Floatation

- *Floatation* is used to separate solids that float from the remaining liquid in a mixture.
- The solids are stirred and when they float to the top, they are skimmed off the surface of the liquid and put into a different container.
- This method is used, for example, in some water purification plants.

It is not essential for students to know that these processes depend on physical changes, not chemical changes.

Assessment Guidelines:

The objective of this indicator is to *use* the processes of filtration, sifting, magnetic attraction, evaporation, chromatography, and floatation to separate mixtures; therefore, the primary focus of assessment should be to apply the procedures to separate a given mixture. However, appropriate assessments should also require students to *recognize* a given procedure that would be appropriate to separate a given mixture; or *summarize* how to separate a given mixture.